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AGRICULTURAL NEWS LETTER

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This publication contains information regarding new developments of interest to agriculture based on laboratory and field investigations of the du Pont Company and its subsidiary companies. It also contains published reports and direct contributions of investigators of agricultural experiment stations and other institutions as related to the Company's products and other subjects of agricultural interest.

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DU PONT TAKES PRECAUTIONS TO KEEP DIRT OUT OF FILM PLANT

Dust, dirt, lint, powder, stray hair -- anything that might injure the ingredients or product during manufacture and packaging--haven't a chance in the air-conditioned, tiled-walled plant where Du Pont motion picture, x-ray, and other photographic film is made.

Before entering, operators are "brushed off" by air. Behind a large perpendicular grille, huge fans create a suction that whisks away all trace of dust, lint, or powder from the operator's uniform. It is a "must" stop for every worker.

Laundry Devoted Exclusively to Dust-Preventive Apparel

Operators wear uniforms, caps, and gloves of lint-proof Irish poplin which are cleaned in a plant laundry devoted exclusively to dust-preventive apparel. Cosmetics, face powder, nail polish, and long fingernails are taboo. Even jewelry must be left outside, for any of these things might cause injury to the film.

In addition, control and precision tests and examinations are made at regular intervals during every step of the entire manufacturing procedure to insure dependable products of high quality.

COTTON LINTERS BASIC RAW MATERIAL FOR MANUFACTURE OF PHOTOGRAPHIC FILM

Du Pont's motion picture, x-ray, and other photographic film has its beginning in the cotton fields of the South.

The fluffy product of our Southern agriculture is one of the basic raw materials from which the crystal-clear base for the film is made. Through chemistry, cotton linters, the short fibers that are removed, either mechanically or chemically, from the cotton seed after ginning, are converted into flaky, snowlike esters of cellulose.

The flakes are mixed with solvents in huge stainless-steel tanks, and form a clear, viscous syrup known as "dope," from which the base for the film is produced. The "dope" is pumped from the mixers to long filter presses where, under tremendous pressure, it is "squeezed" through alternate layers of specially treated filter paper and felt, completely removing any trace of foreign matter.

In other tanks, the "dope" is blended to assure uniformity, and then filtered a second time, emerging as a clear syrup ready for casting into film base on a giant revolving wheel whose mirror-like casting surface is smooth to one ten-thousandth of an inch or less.

Introduction of heat evaporates part of the solvents from the layer of "dope" on the wheel; and before it has made one revolution, this skin of "dope" has become strong enough to be peeled off in one long continuous sheet of uniform thickness. Thus, the crystal-clear base for the film is born.

The base next travels through drying and curing chambers; is wound on giant, stainless-steel spools; and then placed in an intermediate storage room, wrapped in cellophane for further protection.

Manufacturing Operations In Darkness or Barely Discernible Illumination

The rolls of film are then moved to another section of the plant, where they receive a coating of light-sensitive emulsion. From this point forward, all manufacturing operations take place in total darkness or the barely discernible illumination provided by specially designed safelights. The coated rolls of film are mechanically cut into standard sizes, or "slit to fit," as the Du Pont Photo Products Department technologists call it. Faintly luminous safelights enable operators to control cutting machines. A high-powered vacuum cleaner, with an enormous appetite for lint, eats any trace that may appear on the interleaving paper used in packaging the film, which is then ready for shipment and use.

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WAR EXPERIENCE SHOWS HIGH VALUE OF TRAINING BY NATION'S COLLEGES

Young men taken into war industries fresh from college throughout the nation proved the high value of chemical-engineering training provided by these institutions, according to Dr. T. H. Chilton, manager of the Development Engineering Division of the Du Pont Company.

Speaking at the meeting of the Chemical Engineering Division of the Society for the Promotion of Engineering Education in St. Louis recently, Dr. Chilton outlined lessons to be drawn by educators from industry's experiences in war.

Broadly, the experience of the Du Pont Company indicated that good, usable training for conducting the productive work of the chemical industry is well provided by the standard courses, he said.

Special Capability and Good Basic Training Needed for Graduate Study

Dr. Chilton said achievement beyond production -- the development of new products and processes -- is likely to be offered only to those who have demonstrated some special capability.

"And this achievement is accomplished only by those who have a sufficiently solid foundation of basic science and engineering to adapt themselves to new situations," he added.

"This specialized capability is to be acquired by graduate study, beyond the Bachelor of Science level, with opportunity for thesis work and for further intensive courses.

"The aim should never be, however, to turn out narrowly trained specialists, but to offer this opportunity for specialization only to those who have taken the time to acquire the thorough grounding in chemistry, physics and mathematics, and in human relations, too, that will enable them to develop other specialties when the need requires."

Two Phases of Du Pont's Industrial Experience In War

Industrial experiences of the Du Pont Company in war were of two kinds, said Dr. Chilton. One phase required expansion of capacity for making products already developed by methods already proved in operation.

In the other phase, the company was called upon to do something no one had ever done before, to design, construct, and operate facilities for the creation of the new element, plutonium, using methods which not only had not been proved, but which could not even be tried except in a practically full-sized plant unit, he said.

Continued on next page

Recruiting Technical Staffs for Powder and TNT Plants

The problem of recruiting technical staffs for the operation of smokeless powder and TNT plants, he said, was early recognized as one requiring local training of maintenance and operating personnel at plants located throughout the country and training supervisory staffs versed in technology elsewhere and bringing them to these plants.

"The men selected for this training, under a nucleus of people familiar with manufacturing processes, were mostly young men with chemical engineering or chemical education plus some operating experience," said Dr. Chilton.

"But before very long, men directly from college were entered in the training courses. After a period of training in the chemistry of the processes and of actual conduct of operations, they were sent to the new plant locations where they performed an essential function in the production of items in accordance with governmental schedules.

"This procedure proved successful. The plants achieved remarkable production records and nation-wide safety records. The lesson for chemical-engineering education from this experience is that standard training proved its value."

Plutonium Assignment Required Men With Special Capability

Dr. Chilton said a different lesson is to be drawn from the plutonium assignment. For this endeavor, for most phases of which there was almost no precedent at all, he said, a standardized type of training was not sufficient.

"It was necessary to select for participation in this work men who had demonstrated some special capability," he said. "The men who made the most noteworthy contribution to it were those, who, building upon a broad base of scientific and engineering fundamentals, were able to adapt themselves to new and changing conditions.

"For assignment on the development of a process for the separation of plutonium, it was logical to seek out men who had demonstrated their abilities in developing other processes as diverse as the manufacture of 'Lucite' acrylic resin and of titanium pigments.

"When responsibility for designing the Clinton Laboratories pilot unit was undertaken, still more men with special qualifications were called for. The technical coordinating group comprised a number of men who had taken an active part in the development of nylon, or had other specialities, such as heat transfer research, or corrosion investigations.

"A group of machine design specialists and instrument engineers was naturally called in to work out the means for remote observation and remote control required in this unusual plant."

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RESEARCH IMPROVES PHENOTHIAZINE -- "NEAREST IDEAL" WORM CONTROL

With the discovery some years ago that phenothiazine was a remarkable drug for use in the control of numerous kinds of worms in livestock, the problem of manufacturing the chemical in large quantities at a reasonable cost had to be solved.

"Du Pont's pioneering efforts in this development soon made the product available to livestock raisers everywhere," according to Du Pont animal pathologists. "One of the more recent improvements resulting from Du Pont's research is a special form of phenothiazine that can be readily prepared as a drench by using water.

"Du Pont's research workers cooperate closely with other scientists, with manufacturers of remedies, and with stockmen, to give the livestock industry the advantages of this remarkable de-wormer in the most effective and most economical forms. To obtain the fullest benefit from phenothiazine, it should be used in sufficient quantities, and it should be used correctly."

Du Pont veterinarians urge stockmen, when they buy phenothiazine or phenothiazine preparations, to read carefully the directions accompanying the package. These directions will aid any user of phenothiazine to secure the greatest benefit from the drug that has been termed by the U.S. Department of Agriculture as the "nearest ideal" worm control yet discovered.

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INTERNAL WORMS -- LARGEST SINGLE CAUSE OF LOSS TO LIVESTOCK INDUSTRY

A new booklet on the use of phenothiazine for control of internal parasites, recently issued by Du Pont, cites several examples of the successful results in experiments with different kinds of livestock in various parts of the country. For example, figures from 150 Midwest farms show that pigs treated regularly for worms were ready for market an average of seven weeks earlier than pigs from farms where worms were not controlled -- a big saving in feed and higher price from the earlier market. At four months, treated shoats averaged 28 pounds more than those infested with worms.

"This difference increased as the feeding period continued," the booklet says. "It was shown, also, that the average wormy pig, if he lived, needed about one-fifth more feed to reach the same weight as one that was treated."

Diseases, infectious and parasitic, exact almost half a billion dollars a year from livestock producers, says the U.S. Department of Agriculture. An estimated 30 per cent of these losses are due to internal worms, the biggest single item of loss to the livestock industry. The cost of worms is evident in many ways -- stunted growth, reduced production, condemned meat products, feed waste, low resistance to disease, and death losses.

Recommendations for Control of Worms Includes Use of Phenothiazine

Owners of sheep, goats, hogs, cattle, horses, mules, chickens, and turkeys can take numerous precautions to curtail exposure of animals to parasitic infestations and can use effective treatments to remove worms, once the animals are infested.

"Fortunately, there is a particularly effective drug against several of the parasitic worms of greatest economic importance in livestock," says a new Du Pont booklet, "How to Control Worms in Livestock with Phenothiazine". "In the hands of the veterinarian and livestock owner, phenothiazine has proved itself an effective weapon."

In fact, the booklet points out, phenothiazine kills more kinds of worms in more kinds of livestock than any other known drug. In addition, it arrests development of the worm eggs and larvae.

Continued on next page

Advantages Over Previously Known Treatments

"As a worm control, phenothiazine has many advantages over previously known worm treatments," the booklet explains. "Treatment requires no fasting of animals before its use, and no flushing after use. Phenothiazine may be used in the customary individual treatments of animals as a drench, or in capsules, bolus or pellet form, administered with a 'bolling gun', or 'tongs'.

"Phenothiazine can be given to livestock by mixing it with salt, with ground grain feed or ensilage, with minerals, or with slop when used for hogs. This simple method of medication eliminates handling the animals, avoids the risk of injury to both animals and handlers, and saves time and labor.

"Phenothiazine may be used in two types of doses for the control of worms in livestock; as a worm-remover in amounts large enough to expel most of the worms outright; or in small amounts every day as a preventive to curtail development of infestation. In either case, the feeding method of administration may be used."

Good Feed and Sanitation Important

The booklet makes it clear that good animal husbandry does not begin nor end with worm treatments.

"In many cases, the ravages of worms are more severe because of insufficient feeding and pasture," it says. "Sanitation, to prevent disease, is also an important factor in the profitable production of livestock and poultry. After livestock have become infested with worms, treatment is the only course of action, and use of a medicine like phenothiazine is the quickest and surest way to minimize losses."

Since worm problems vary in different areas, the booklet advises livestock growers to take advantage of the localized recommendations of animal-pathology authorities in the State College or Experiment Station, either by writing directly to them or by asking the county agent for available information. It adds: "If there are no specific recommendations issued by the State authorities, the recommendations of the U.S. Department of Agriculture serve as the best guide."

These recommendations are summarized briefly in the booklet, which will be sent free upon request. Address the Agricultural Chemicals Division, Grasselli Chemicals Department, Du Pont Company, Wilmington 98, Delaware.

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NEW INSECTICIDE HELPS CHECK GRASSHOPPER INVASION IN SARDINIA

Hexachlorocyclohexane, a new insecticide, proved effective in helping to check the recent serious crop-destroying grasshopper invasion in Sardinia, Du Pont officials have been informed by UNRRA.

More than 300 pounds of the latest weapon in the arsenal against insects, now being made on an experimental scale, were donated by Du Pont and flown overseas by UNRRA.

Heavy inroads were made in the ranks of the grasshoppers after the hexachlorocyclohexane arrived to aid the Sardinian farmers. Observers report that the pests assisted in the annihilation by feeding on carcasses of their poisoned brothers. Death is said to follow as late as the fourth day after the cannibalism.

Invasion of Mainland Warded Off

Millions of dead grasshoppers were shovelled off roads into ditches, according to communiques from the stricken area. Application methods include spraying from trains. The application of the new insecticide helped greatly to bring the worst locust (grasshopper) plague in Sardinian history under control before thousands of tons of desperately needed food crops could be destroyed. An invasion of the mainland was also warded off.

Shows Promise Against Some Insects Heretofore Difficult To Control

The insecticide was developed during the war by Imperial Chemical Industries, Ltd., of England, and has been tested there and in Africa. A pilot plant for limited production of hexachlorocyclohexane recently began operation at the Du Pont plant at Grasselli, N. J.

Commercial introduction of the chemical into this country must await its evaluation in comparison with existing insecticides and under conditions encountered in American agriculture. In tests to date in the United States, this compound, sometimes called benezene hexachloride, shows promise against some of the insect pests of economic importance in agriculture for which there have been no satisfactory control measures.

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U.S.D.A. CATALOGUE, BEGUN IN 1891, LISTS ABOUT 100,000 ANIMAL PARASITES

A combination rogues gallery and doomsday book of animal parasites, 55 years in the making by government scientists, now contains more than a million entries and lists about 100,000 different parasitical pests that attack man and animals.

This catalogue is the U.S. Bureau of Animal Industry's "Index-Catalogue of Medical and Veterinary Zoology." It continues to grow, and saves many hours of labor by showing quickly what is already known and what is unknown in this branch of science. It is in the form of a comprehensive card catalogue, filed in the U.S. Department of Agriculture's zoological laboratory at the Agricultural Research Center, Beltsville, Md. The combined references are based partly on reports appearing in 11,000 publications printed in 33 languages, and partly on information and specimens obtained by correspondence and original research.

Provides Basis for Federal Quarantine Regulations

The catalogue provides the basis for several federal quarantine regulations and other safeguards against importations of diseased animals and products. The information has been of value in determining the answers to questions from the Army, Navy, and medical officers on a wide range of technical and practical problems relating to human health.

In feeding troops in wartime, a frequent question concerns the safety of meat supplies from native animals in foreign countries. For instance, the catalogue was especially useful in making long-distance diagnosis of parasites of sheep in North Africa during World War II. This diagnosis, made within three hours of receipt of the request for information, resulted in a prompt airplane shipment by the Du Pont Company of enough phenothiazine to treat about 2,000,000 North African sheep which were heavily infested with stomach, nodular, and other destructive worms.

Detailed Classified Information Needed

"When one realizes that scores of parasites look very much alike, that most of them assume different forms at different stages of their development, and that many hide away within the bodies of host animals, the need for detailed classified information is evident," says the U.S. Department of Agriculture's "Research Achievement Sheet No. 43-(A)," entitled "Catalogue of Animal Parasites of the World." This statement, prepared by Dr. Benjamin Schwartz, Zoological Division, and D. S. Burch, Information Division, Bureau of Animal Industry, says:

Continued on next page

"The development of this special kind of catalogue dates back to 1891. At that time Dr. Albert Hassall, a young scientist of the Bureau of Animal Industry of the U.S. Department of Agriculture, frequently was assigned to look up references on parasites for his chief, Dr. Charles Wardell Stiles. These references were often difficult to find because the literature of medical zoology was then -- and still is -- widely scattered. But Hassall persevered and, when successful, made notes on cards that he kept for future use. To make the cards as useful as possible, Hassall classified them in three main sections, one for the parasites themselves, another for their hosts, and the third for the scientists who reported their observations. After Hassall retired from the Department, other professional employees continued the work."

How Catalogue Is Used to Identify Parasites

A person wishing to identify a parasite from any part of the world, and knowing the host, goes first to the host section of the catalogue to see what parasites have been reported for that host. He then searches the parasite section for descriptions and illustrations to help him identify the parasite at hand, or perhaps he finds that it has never been described and represents, therefore, a new species.

As an example of how complete the information is, the section on the parasites themselves contains these entries: Name of parasite, name of host, location within host, locality in which host was found, name of author of paper reporting parasite, date of publication, and pages where the account appears.

Until about 1936, responsibility for the catalogue was shared by the Zoological Division of the Bureau of Animal Industry, U.S. Department of Agriculture, and the Zoological Division of the Hygienic Laboratory, U.S. Public Health Service. Since that time the Department of Agriculture has carried the responsibility for the work. In addition to Hassall and Stiles, the Research Achievement Sheet credits C. Myers, M. Potter, Mildred A. Doss, M. M. Farr, G. B. Carson, D. B. Segal, and others for their participation in the work. It also lists a number of publications, some now out of print, based on the catalogue.

NOTE: For additional information on the Index-Catalogue, discussed above, write Miss Mildred A. Doss, U.S.D.A. Zoological Laboratory, National Agricultural Research Center, Beltsville, Maryland. Miss Doss is now in charge of this work.

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ECONOMIC CONSEQUENCES OF PULLORUM DISEASE OF POULTRY

Pullorum, characterized by the U.S. Bureau of Animal Industry as "the most insidious and devastating of all poultry diseases," injures the productivity of hens and lowers the livability of chicks, according to the most recent U.S.D.A. Yearbook of Agriculture entitled "Keeping Livestock Healthy."

Disease Exists In Every Part of Country

The late Dr. Hubert Bunyea, veterinarian of the BAI, explained that although definite statistics on the annual loss to the poultry industry in the United States from pullorum disease are not available, "it is known that the disease exists in every part of the country and probably in every locality where appreciable numbers of poultry are kept." He added:

"It would be impossible to estimate the cost of the disease to the industry through the death of baby chicks alone, not to mention diminished egg production in hens and pullets, reduced hatchability of eggs, and occasionally the death of hens due to generalized pullorum infection."

Disease Caused By Toxin-Forming Germ

Dr. Bunyea pointed out that the disease is caused by the toxin-forming germ Salmonella pullorum.

"Although this germ is easily destroyed, it has been known to remain alive in soil or manure in sheltered places for many days, or even for months," he stated.

Besides occurring in chickens, pullorum disease has come to have increased importance as an infection of turkeys. It has also been observed in ducks, sparrows, European bullfinches, pigeons, quail, geese, pheasants, bittern, peafowl, goldfinches, greenfinches, green canaries, turtledoves, guinea fowl, and rabbits. Human beings and other mammals are not known to be affected.

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FORMALIN FUMIGATION OF HATCHERS BY CHEESECLOTH METHOD TESTED

Control of pullorum disease is primarily a matter of flock hygiene. Poultry-disease authorities emphasize that solution of the problem in the main depends on successful diagnosis of the disease in carrier adults, so that such adults may be eliminated or excluded from breeding flocks.

Poultrymen point out that pullorum disease is capable of spreading from infected to healthy chicks in all the various types of incubators, hatchers, and brooders when some of the eggs hatched are from infected parent stock or where infection results from the presence of the infecting bacteria in such structures.

Since hatchery chicks are distributed over a wide territory, the disease may cause enormous losses over large areas. Many progressive hatcherymen have already realized the importance of taking the initiative in controlling pullorum disease in their communities. They require that flocks that supply them with eggs be tested for the presence of carriers of the disease.

Fumigation of hatchers, incubators, brooders, and other poultry equipment and structures is an important part of the program of sanitation recommended by poultry scientists. The fumigation research work reviewed below is therefore of considerable importance in the program of control sponsored by various interested groups under the National Poultry Improvement Plan inaugurated in 1935.

Simply hanging a strip of cheesecloth moistened with formalin* inside the hatching-compartment door destroys in the hatcher heavy infestations of the bacteria that cause the dread pullorum disease of poultry.

That is the finding of the Department of Poultry Husbandry of Ohio State University in tests designed to obtain additional information on the cheesecloth method of formaldehyde fumigation; as well as to determine whether the recommendations for fumigating older models of incubators are satisfactory for the newer models and for separate hatchers; and to obtain data on the frequency of fumigation required to maintain concentration of

*The term formalin, as used in this article, has reference to a 37% solution, by weight, of formaldehyde in water.

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formaldehyde sufficient to kill Salmonella pullorum during the hatching period.

According to George S. Godfrey, Richard Buss, and Alden R. Winter, Ohio research workers, in a paper entitled "Formalin Fumigation of Hatchers by the Cheesecloth Method," in "Poultry Science,"Vol. 24, No. 5, previous research work by others showed that formalin fumigation was more efficient when the formalin was evaporated from cheesecloth than when it was poured over potassium permanganate. Less than half as much formalin was needed by the cheesecloth method, in two fumigations, to give the same results as obtained by the older potassium-permanganate method, in three fumigations. And, the use of potassium permanganate was eliminated. Meantime, incubator models have been changed and separate hatchers have come into general use.

Tests Conducted In Ohio State Laboratory and Five Nearby Hatcheries

Because some hatcherymen with the newer equipment, who have used the early recommendations for incubator fumigation, experienced trouble and others questioned the effectiveness of the fumigation, the Ohio research workers undertook tests in different types of machines in the departmental incubation laboratory at Ohio State University and in five nearby hatcheries.

They determined that the bacteria content of the air in both separate hatchers and incubator-hatchers increased during the time chicks were hatching and held in the machines.

"The bacteria per cubic foot of air, during the hatch, was greater in separate hatchers than in incubator-hatchers," they report. "This was due to the greater number of hatching eggs per cubic foot of air space in the separate hatchers."

Results of Ohio Experiments

Godfrey and his associates summarize the results of their experiments as follows: "Fumigation with 15 cc. (½ fluid ounce) of formalin per 100 cubic feet of space, by the cheesecloth method, was sufficient for the destruction of Salmonella pullorum. The cheesecloth method of fumigation was satisfactory for use during hatching in four of the five separate hatchers in which it was tested."

The manufacturer of the machine that gave unsatisfactory results does not advise use of the cheesecloth method of fumigation.

Cheesecloth Method of Fumigation Explained

The Ohio scientists explain that fumigation was carried out by hanging a strip of cheesecloth moistened with formalin just inside the hatching-compartment door. From 12 to 18 cc. of formalin and about one-half square yard of cheesecloth were used for each 100 cubic feet of incubator volume, based on outside dimensions.

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"The amounts of formalin used were based on the recommendations of the incubator manufacturers or the amounts being used by hatcherymen where the tests were made," they state. Results are shown in the following table:

Effectiveness of Cheesecloth Method of Fumigation of Hatchers

Machine	Amount of formalin per 100 cu.ft. of space*	Number of trials	Effect on exposed S. pullorum
Separate Hatchers	cc		
A	18	6	All killed within 10 minutes
B	16	11	All killed within 10 minutes
D	15	3	All killed within 30 minutes
E	15	5	All killed within 30 minutes
F	18	17	All killed within 30 minutes
Incubator Hatchers			
H	14	8	All killed within 30 minutes
I	12	4	90% killed within 4 hours

* Based on outside dimensions.

"Machines A and B were fumigated in part of the trials while empty and in others while chicks were hatching. S. pullorum was killed in most cases during a 5-minute exposure period, and in all cases during 10 minutes exposure, beginning with the introduction of the formalin," the authors explain. "The fumigation did not appear to injure the chicks in Machine A in any way.

"Machine B was fumigated in two trials, while filled with eggs which where hatching. The chicks were affected by the fumigation as indicated by gasping and hoarse 'rattle' or 'wheeze.' The automatic ventilator probably did not open soon enough or for a sufficiently long interval to permit the escape of enough formaldehyde to prevent injury of the chicks." This is the machine for which the cheesecloth method is not recommended by its manufacturers.

"Salmonella pullorum was killed in Machines D, E, F, and H within a period of 30 minutes from the time of the introduction of the formalin," the authors continue. "Some trials indicated that it was killed in a much shorter time. The minimum time to kill was not determined since it would seldom be necessary to open a machine for several minutes after the formalin was introduced." These four machines were filled with eggs which were hatching at the time some of the tests were made. The fumigation did not appear to injure the chicks.

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Duration of Effectiveness

The authors present data on the duration of the effectiveness of a single fumigation. There was sufficient formaldehyde remaining in the machines four hours after fumigation to kill S. pullorum when exposed for one or more hours. One machine, H, still retained a strong odor eight hours after fumigation.

"Pullorum introduced at this time was killed during a 13-hour exposure," they report. "Possibly the curtains in this machine absorbed some of the liberated formaldehyde, and thereby slowed down its escape from the machine."

More Data Needed On Length of Time Fumigation Is Effective

The Ohio scientists point out the need for more data on the length of time a single fumigation with formalin is effective for destruction of S. pullorum. They add: "There is need for a fumigant that can be kept in sufficient concentration for the destruction of S. pullorum in the hatchers, throughout the entire hatching period, and which will not be injurious to the chicks."

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ABOUT THREE-FOURTHS ACRE OF NITROGEN-FERTILIZED PASTURE MAINTAINS HEIFER 5½ MONTHS - 1¼ TO 2½ ACRES OF UNFERTILIZED LAND REQUIRED

Fertilization of permanent pasture with nitrogen is one way to step up production of dairy products, and with comparatively little cost, says "Hoard's Dairyman," for June 10, 1946.

The publication says that it has been demonstrated that "with nitrogen-treated and rotationally-grazed pasture, 0.83 of an acre has been enough to maintain a heifer weighing 800 pounds during a 5½-month grazing period, while 1.27 acres of untreated but rotationally-grazed pasture has been required for this purpose." The item continues:

"In practical language, it takes about three-fourths of an acre of well-fertilized land to support a heifer 5½ months, but 1¼ acres of unfertilized land. We know of pastures where even twice this amount of acreage of untreated land would not maintain a heifer weighing 800 pounds for 5½ months."

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VIRUS DISEASES OF POTATOES TRANSMITTED FROM DISEASED TO HEALTHY PLANTS BY APHIDS THAT OVERWINTER ON CERTAIN WEEDS

Weeds not only cause serious reduction in crop yields and quality by competing for moisture, soil nutrients, and sunlight, but they hinder harvesting and often harbor fungi and plant-disease-carrying insects or aphids, thus aiding indirectly in the spread of virus diseases of the potato.

For that reason, destruction with chemical herbicides, such as Du Pont's "Ammate" Weed Killer, of such host weeds offers an important means of reducing crop losses due to virus diseases which frequently reduce yields of potatoes as much as 50 per cent or more.

Virus-free potato plants can come only from virus-free seed, but healthy plants do not remain healthy if diseased plants and insect vectors of the disease are nearby.

Transmission of virus diseases depends on certain insects or aphids. For example, the spread of leafroll virus from diseased to healthy potato plants is due to the activity of four species of aphids -- the potato aphid, peach aphid, buckthorn aphid, and foxglove aphid. Dwarf buckthorn, a plant on which the buckthorn aphid overwinters, is frequently found in adjacent low-lying fields and thickets. A similar relationship has been observed between green peach aphid and the presence of wild plum, and between certain of these aphids and wild roses.

Certain weeds, particularly wild rutabagas or "mustard," wild radish or "kale", and hemp nettle, are very favorable food plants for the aphids and of great importance as hosts on which to multiply.

During late spring and summer the aphids often build up large populations on these weeds, eventually leading to the production of winged forms, which are important in disease transmission. Some greenhouse studies on the breeding potential of aphids indicate that as many as 2,500 winged peach aphids may develop in a short time on a single mustard plant from one parent aphid.

NOTE: As reported in Maine Agricultural Experiment Station Misc. Pub. 602, reviewed on the next page, ammonium sulfamate (the active ingredient in Du Pont's "Ammate" Weed Killer) has been found effective in the control of such host weeds as wild plum, wild roses, and dwarf buckthorn.

Agricultural News Letter (Du Pont)
Vol. 14 No. 5 September-October, 1946

CHEMICAL DESTRUCTION OF WEEDS ON WHICH PLANT-DISEASE-CARRYING APHIDS OVERWINTER HELPS CONTROL VIRUS DISEASES OF POTATOES

The menacing population of disease-carrying aphids can be reduced by use of suitable insecticides and by destroying those weed plants on which the aphids overwinter and on which they multiply rapidly before dispersing to the potato plant.

Because a number of herbicides developed during recent years seemed to offer the best means of destroying offending weed growth, Dr. G. P. Steinbauer and Dr. F. H. Steinmetz at the Maine Agricultural Experiment Station conducted experiments on methods of eradicating those weeds that favor the overwintering and propagation of aphids known to transmit virus diseases of potatoes. Their findings are reported in Maine Agricultral Experiment Station Miscellaneous Publication 602, "Eradication of Certain Maine Weeds, An Important Step In Control of Potato Diseases Spread by Aphids."

They point out that, although methods of weed control may vary in details, most of them are based on one or more of the following means of destroying plantlife: (1) Alteration of soil conditions; (2) drying or dehydration; (3) starvation; (4) prevention of seed formation; (5) burning; and (6) use of herbicides.

"In some cases weeds can be most effectively killed by injecting castic or poisonous substances into the plant or by spraying the foliage," the Maine scientists explain.

Methods of Eradicating Wild Plum

The authors discuss both methods for eradicating wild plum, Prunus nigra Ait., which is frequently found along roadsides, fences, and in thickets on farms.

Injection of Chemicals Into Tree -- Since cutting results in production of many succulent sucker sprouts which actally furnish better food and protection for the overwintering aphids than the original trees, injection of poisonous substances into weed trees has long been used as a means of eradication, the Maine authorities say.

"A large number of wild plum trees, with stem diameters ranging from a few inches to a foot or more, were treated with a variety of poisons," they report. "These chemicals were applied either by pouring solutions into the wood where it had been frilled with an axe, or by pouring solutions into 3/4-inch holes drilled into the tree. The holes were drilled to a depth of about 3 inches, spaced about 3 inches apart around the circumference and directed on a downward slant."

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Chemicals that killed the entire trees, including sprouts, were a saturated solution of copper sulfate or blue vitriol; two pounds of ammonium thiocyanate to a gallon of water; two pounds of ammonium sulfamate, the active ingredient in Du Pont's "Ammate" Weed Killer, in a gallon of water; and four pounds of sodium arsenite to a gallon of water.

"Applying the solutions through holes was more effective than pouring them into wood frilled with an axe. Poison injection is a simple, inexpensive, and effective way of killing trees without the danger of sucker sprout formation," the Maine research workers add.

Use of Herbicide Spray -- Since wild plum often occurs in thickets where the individual plants vary in stem diameter from the thickness of a pencil to several inches, poison injections are impractical, except in the larger trees. In these cases the Maine research workers found that the entire thicket could be killed by spraying it with a solution of ammonium sulfamate, one pound to a gallon of water, best applied during the latter part of August or the first part of September.

"Complete coverage of the foliage is essential," they explain. "The spray may be applied with a knapsack sprayer, a bucket sprayer, a barrel-type sprayer, or a power sprayer."

In applying spray to large thickets it is most convenient to use an orchard spray gun attached to a power sprayer with a spray hose, or to use a special type of spray boom, which can also be used to apply "Ammate" to large potato refuse piles to prevent spread of late blight,* and for applying herbicides along fences, headlands, and roadsides. The bulletin contains a drawing and instructions for making the special type of spray boom.

Treatment of Seedlings -- The Maine scientists point out that, although poison injections and use of "Ammate" sprays will kill plum trees and thickets, they may not injure the embryos contained within plum fruits or "pits." A number of seedlings often come up beneath a thicket previously killed with the spray.

"These young seedlings may be killed either by spraying with ammonium sulfamate solution or covering the ground with crude borax powder, at the rate of 15 pounds per square rod. Borax may sterilize the soil for some time, preventing plant growth."

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*Dr. Steinbauer, in another Maine bulletin, No. 434, estimates that late blight or "rust" causes an annual loss of nearly 4,000,000 bushels or about 9 per cent of the total Maine crop, despite the fact that more than $1,000,000 a year is spent on copper fungicides in the State's spraying program. He urges community action to destroy potato refuse piles, and recommends treating such heaps with chemicals, among which he lists ammonium sulfamate at the rate of 1 pound to one gallon of water.

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Pulling or Burning, Followed by Use of "Ammate" -- Where a great deal of combustible material such as hay or straw is available it may be piled in plum thickets and burned, thus killing the sprouts and trees, the authors continue. Thickets pulled or burned should be examined later for recurrence of sprouts and germination fruits. These sprouts and seedlings can be killed with ammonium sulfamate sprays.

Methods of Eradicating Dwarf Buckthorn and Wild Roses

The Maine publication says: "Dwarf buckthorn, Rhamnus alnifolia, is a low-growing shrub most often found in low, moist fields and thickets. Thoroughly covering the foliage with ammonium sulfamate spray, one pound to a gallon of water, late in the growing season should effectively kill dwarf buckthorn. Similar treatment should be applied to wild rose bushes growing near potato fields."

Eradication of Weeds Along Roadsides, Fences, and Headlands

Kale, mustard, and hemp nettle growing along roadsides, fences, and on headlands can be successfully treated with herbicides, the leaflet says.

Spray Machinary Should Be Thoroughly Cleaned

After discussing the control of weeds in grain fields and in crimson clover, the Maine publication lists a number of precautions in the use of herbicides. For instance it says:

"Spray machinery used in applying the chemicals referred to in this bulletin should be thoroughly rinsed out after use. In doing this it is well to add some lime to the first rinse, followed by water. This will neutralize the mildly acid condition of some of the herbicide materials and thus aid in preventing corrosion of metals."

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NOTE: Copies of the Maine publications, No. 434 and No. 602, are available upon request. Address Bulletin Editor, Maine Agricultural Experiment Station, University of Maine, Orono, Maine.

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